

1 **VIDEO AND DIGITAL MULTIMEDIA ACQUISITION**
2 **AND DELIVERY SYSTEM AND METHOD**

3 **Related Applications**

4 This application is a continuation-in-part of co-pending U.S. patent application serial
5 number 09/920,723, entitled "Video and Digital Multimedia Aggregator," filed on August 3,
6 2001, which is hereby incorporated by reference.

7 The following U.S. Patents also are incorporated by reference:

8 U.S. Patent 5,798,785, entitled "Terminal for Suggesting Programs Offered on a
9 Television Program Delivery System;"

10 U.S. Patent 5,986,690, entitled "Electronic Book Selection and Delivery System;"

11 The following co-pending U.S. patent applications also are incorporated by reference:
12 patent application serial number 07/991,074, filed December 9, 1992, entitled
13 "Remote Control for Menu Driven Subscriber Access to Television Programming;"

14 patent application serial number 08/906,469, filed August 5, 1997, entitled
15 "Reprogrammable Terminal for Suggesting Programs Offered on a Television Program
16 Delivery System;"

17 patent application serial number 09/191,520, filed November 13, 1998, entitled
18 "Digital Broadcast Program Ordering;"

19 patent application serial number 09/289,957, filed April 13, 1999, entitled "Electronic
20 Book Alternative Delivery Systems;"

21 patent application serial number 09/289,956, filed April 13, 1999, entitled "Electronic
22 Book Alternative Delivery Methods;" and

23 patent application entitled "Video and Digital Multimedia Aggregator Remote
24 Content Crawler," and patent application entitled "Video and Digital Multimedia Aggregator
25 Content Suggestion Engine," filed on August 3, 2001.

26 **Technical Field**

27 The technical field is television program and digital multimedia delivery systems that
28 incorporate intelligent and flexible program search and delivery mechanisms.

29 **Background**

30 Cable television delivery systems greatly expanded the array of programs available to
31 television viewers over that provided by over-the-air broadcast systems. Subsequently,

1 satellite television delivery systems, and in particular, digital satellite broadcast systems
2 further expanded the viewing choices for consumers. In the near future, digital broadcast
3 television systems will provide many more programming choices for consumers.

4 In addition to television programming delivered through television program delivery
5 systems, other programs and events may be sent to consumers. These other programs and
6 events include streaming video sent over wired and unwired, narrowband to broadband
7 services, digital audio programs, and other multimedia data.

8 Unfortunately, customers are still limited in their television viewing choices by the
9 local and regional nature of television delivery systems. For example, a broadcaster in
10 Boston may provide programming of local interests to people in Massachusetts while a
11 broadcaster in Seattle may provide different programming to people in the Seattle area. A
12 person in Boston generally cannot access Seattle programming, other than programming that
13 is provided at a national level.

14 In addition to this local/regional market segregation, many other sources of
15 programming and events may not be available in a specific viewing area. These other
16 sources may include audio programming, streaming video, local or closed circuit television
17 programming (e.g., education television programming provided by a state education
18 department) and other programming.

19 Even if certain programming is available in a local viewing area, a viewer may not be
20 aware of its existence. This situation may be the result of a large array of available
21 programming coupled with a limited program menu or guide. The program guide may be
22 limited in that not all available programming can be listed, some programming changes occur
23 that are not reflected in the program guide, and errors may exist in the program guide. In
24 addition, the more comprehensive the program guide, the harder it is for the viewer to search
25 and navigate the program guide to find a desired program.

26 **Summary**

27 The problems noted above are solved by the video and digital multimedia aggregator
28 system and method described herein. Program content can be packaged and delivered by the
29 system, including video, television, radio, audio, multimedia, computer software, and
30 electronic books, or any content that can be delivered in digital format.

The aggregator comprises a request and results processing server, a search engine server coupled to the request and results processing server and a content acquisition server coupled to the request and results processing server. The request and results processing server receives a request for a program, the search engine server searches for the program and the content acquisition server acquires a program for delivery to the user. The request and results processing server includes a search request processor that receives information related to the user's search request and provides the information to a search results form builder that creates an electronic search request. The search request may be augmented by using a content search suggestion engine to add additional search terms and descriptions to the search request. The aggregator may also include a decoder that decodes program content and program metadata from remote sources for storage at the aggregator, and an encoder that encodes content metadata and programs for delivery to the user. The aggregator may also comprise one or more crawlers, such as a content crawler, to look for program content in the digital communications network.

The search engine server searches at least a local content database. The local database comprises at least two file types. A content file includes a complete program content file. For example, the 1997 movie *Titanic* may exist in the local content database as a complete program content file. The complete program content file may also include a reference content or metadata that contains additional information related to the content. Such additional information in the reference content may include: a program description, including program rating, program description, video clips, program length, format (e.g., 4x3 television or 16x9 movies), and other information; billing information and digital rights management information; viewing statistics, including number of times viewed, dates/times viewed, identity of users viewing the program; advertisement information to allow ads to be inserted during viewing of the program; and other information.

The additional information in the reference file may be provided in whole or in part to the system users. For example, the aggregator may provide a program description and accompanying video clips to selected systems users. The reference file may also be used by the aggregator for system administration purposes. For example, billing and digital rights management information may be used to collect appropriate fees from system users and to provide such collected fees to the entities owning rights in the content.

1 A remote content crawler continually crawls the digital communication network
2 looking for content to provide to the aggregator. The content provided to the aggregator may
3 be stored in a form of an entire content file. For example, the content may include an entire
4 movie, television program or electronic book. Alternatively, the content provided to the
5 aggregator may be a reference to a content file that is stored at, or that will be available at
6 one of the remote locations. For example, the content may be a reference to a future,
7 scheduled live sports event that will be made available to system users. The sports event
8 may be provided for a one-time fee, as part of a sports package, for which a fee is collected,
9 or as a free event. In the examples discussed above, the content may be stored at the
10 aggregator, and may subsequently be provided to system users. For the example of the live
11 sports event, the aggregator may store the live sports event and may then provide the sports
12 event as a replay, in addition to facilitating live viewing of the sports event.

13 **Description of the Drawings**

14 The detailed description will refer to the following drawings in which like numerals
15 refer to like elements, and in which:

16 Figure 1 is a block diagram of primary components of a content search, packaging,
17 and delivery system;

18 Figure 2 is a block diagram of the components of the content search, packaging, and
19 delivery system configured to deliver content to a set top terminal;

20 Figure 3 is a block diagram of the components of the content search, packaging, and
21 delivery system configured to deliver content to a personal computer terminal;

22 Figure 4 is a schematic of the components of the content search, packaging, and
23 delivery system showing subsystems of an aggregator, a user terminal, and a remote content
24 server;

25 Figure 5 is a schematic of subsystems of a request and results processing server and
26 components with which the processing server interacts as part of the content search,
27 packaging, and delivery system;

28 Figure 6 is a schematic of subsystems of a content acquisition server and components
29 with which the content acquisition server interacts as part of a content search, packaging, and
30 delivery system;

Figure 19 is a block diagram of operational modules of a communications method that may reside in the communications system of Figure 15.

DETAILED DESCRIPTION

Figure 1 is a block diagram of a content search, packaging, and delivery system 200. The content to be packaged and delivered by the system 200 includes video, television, radio, audio, multimedia, computer software and electronic books. Components of the system 200 include an aggregator 201 and a user terminal 202, which are connected using a wide area distribution system 203. Other components are remote content servers 204 that exchange data with the aggregator 201 using a wide area network/Internet 205 connection and external content sources 232 that provide other content data to the aggregator 201. The user terminal 202 may incorporate a video display system 207, an audio playout system 208, an audio/video recording system 209, user input devices 214, an electronic book reader 230, and a connection to a home network 229 to interact with other devices in the user's home environment. Alternatively, one or more or all of the video display system 207, the audio playout system 208, the audio/video recording system 209, and the electronic book reader 230 may be separate components that are coupled to the user terminal 202.

The system 200 allows a user to enter search parameters, such as keywords and category headings, and have the aggregator 201 use these parameters to locate, package, and deliver content to the user terminal 202 from numerous sources. The requests and content deliveries can be sent over communications links including, but not limited to, telephone lines, coaxial cable, fiber-optic cable, wireless connections, satellite networks, terrestrial broadcast systems, wide area networks, the Internet, physical media distribution, and other communication media collectively represented by the wide area distribution system 203. The numerous sources of content are shown in Figure 4 and include, but are not limited to, an aggregator local storage 254, local streaming sources 262, remote content storage 258, and remote streaming sources 259. In an embodiment, the local streaming sources 262 are comprised of the audio and video channels being delivered using a cable headend system that may house the aggregator 201.

The system 200 will take a user's search request and may perform a search of virtually every active and scheduled radio and television channel in the world, as well as archived sources of video and audio programming such as movies and recorded audio

sources, and sources of other multimedia, software, and electronic book content. In an embodiment, the system 200 will also search Internet Web sites and other online databases. The user will then be able to select programming or other content for download based on the search results. In an embodiment, the download, or delivery, process can be fulfilled by making the content available on a specific channel of a cable television or other broadcast system, or by transmitting the content using a digital communications protocol, such as the Internet standard TCP/IP, for example. In addition, the content search, packaging, and delivery system 200 is capable of formulating and presenting a list of suggested content based on an analysis of the user's current search parameters, stored information about previous searches and previously selected content downloads and other user-specific or related information. The system 200 is also capable of notifying a user prior to the start time of selected programming and availability of other content using such notification as an electronic mail message and/or an on-screen message indicating that the scheduled program will be broadcast at a specified time. The system 200 may support one or more digital rights management (DRM) systems to track the copyrights and usage rights associated with downloaded content and bill the user's account as appropriate and provide any license and usage fees to the content provider. The system 200 may implement a users' privacy protection scheme allowing users to control what information is gathered, limit what is done with that information, and review and delete information in the user's profile if desired.

An overview of an embodiment of the system 200 is shown in Figure 2 where the user terminal 202 is a set top terminal 206 that communicates with the aggregator 201 through a cable television system headend 210, thereby making use of the cable television system headend 210 high bandwidth concatenated cable system 216. Further, the set top terminal 206 system may include a tuner 228, a demultiplexer 231, a video display system 207, an audio playout system 208, an audio/video recording system 209, user input devices 214, an electronic book reader 230, and a connection to the user's home network 229. These components may be used to tune, select, view, listen to, and store audio and video programming and other content delivered by the search, packaging, and delivery system 200. Figure 2 also shows a communications path from one or more remote content servers 204 through the wide area network/Internet 205 directly to the set top terminal 206, which bypasses the aggregator 201 and cable television system headend 210. This path may be

1 used in the case where the requested content is available in the required format from the
2 remote content server 204 and is authorized for direct delivery to the user. In an alternative
3 embodiment, the aggregator 201 is collocated with the cable television system headend 210
4 that is acting as the wide area distribution system 203 as is the case when a cable television
5 system is also serving as the user's Internet service provider.

6 An overview of another embodiment of the system 200 is shown in Figure 3, where
7 the user terminal 202 is a personal computer terminal 211 that communicates with the
8 aggregator 201 through an Internet service provider/cable television system headend 215. In
9 this case, the content may be delivered by a cable headend that is operating as an Internet
10 service provider (ISP). The personal computer terminal 211 also may include a video display
11 system 207, an audio playout system 208, an audio/video recording system 209, user input
12 devices 214, an electronic book reader 230, and a connection to the home network 229. A
13 communications path also exists from one or more remote content servers 204 through the
14 wide area network/Internet 205 directly to the personal computer terminal 211, which
15 bypasses the aggregator 201 and the Internet service provider/cable television system
16 headend 215 in the case where requested content is in the required format and is authorized
17 for direct delivery to the user.

18 The user can receive video and audio programs (i.e., the content) in a number of
19 different ways. First, the tuner 228 in the user terminal 202, shown in Figure 2, can simply
20 tune to the desired program, or the demultiplexer 231 can select a program from a digital
21 multiplex, thereby displaying the program at the appropriate time. However, the desired
22 program may not be broadcast by the user's cable television system headend 210, or the user
23 would like to watch a program supplied by the local headend, but not subscribed to by the
24 user, e.g., a boxing match broadcast by a premium channel that the user does not ordinarily
25 receive. In these examples, the program can be delivered to the user by the aggregator 201
26 using the telephone lines, fiber-optic transmission lines, or other communication media, or
27 using the cable television system headend 210. In an embodiment, the aggregator 201 can
28 supply the desired program to the user by pulling programs from program delivery systems in
29 the United States and abroad and delivering the program to system users. Therefore, a user
30 can have access to programs outside the user's immediate viewing area.

Figure 4 shows an embodiment of the system 200 and system components in more detail. At a user's location, the user terminal 202 includes a tuner 228, a demultiplexer 231, a user terminal processor 227, user local storage 212 and user local database 213. Coupled to the user terminal 202 may be user input devices 214, a video display system 207, an audio playout system 208, an audio/video recording system 209, an electronic book reader 230, and a connection to the home network 229.

The user terminal 202 is coupled through the wide area distribution system 203 to the aggregator 201 and further through the wide area network/Internet 205 to remote program sources. The remote program sources include remote streaming sources 259 and remote central storage 258. The remote program sources also include remote databases 261 and, through the remote content server 204, a remote server database 260.

The aggregator 201 may include a communications server 250 that communicates with the user terminal 202 through the wide area distribution system 203. The communications server 250 receives inputs from a request and results processing server 300, a content delivery server 450 and a system administrator 500. The content delivery server 450 receives inputs from a coder and content formatter 253 and a content acquisition server 400. The content delivery server 450 also accesses an aggregator local storage 254 and local streaming sources 262. Finally, the content delivery server 450 provides an output to the system administrator 500.

The coder and content formatter 253 receives inputs from the content acquisition server 400, the aggregator local storage 254 and local streaming sources 262. The system administrator 500 receives inputs from the content and delivery server 450, and communicates with the content acquisition server 400, the request and results processing server 300, a search engine server 350 and aggregator archives 255. A decoder and content formatter 252 is coupled to the content acquisition server 400. Finally, a network gateway 251 couples components of the aggregator 201 with the remote content server 204 through the wide area network/Internet 205.

Content received at the aggregator 201 may be input to the formatter 253. The formatter 253 reformats all input content into a format that is readily received by one or more user terminals 202 operably connected to the delivery system 200. In addition, the formatter 253 can store full or partial copies of content in compressed form in the aggregator local

8 The aggregator 201 can also implement a screening process for limiting the number
9 of programs captured to those programs with a viewing audience above a predetermined
10 threshold. In effect, the aggregator 201 contains a filter that will pass only programs meeting
11 the predetermined selection criteria. The filter may include programming that screens the
12 content to reject specific items, such as adult content, for example.

13 The system administrator 500 records what fees should be paid and to whom. For
14 example, the aggregator 201 will determine to whom any copyright or other fees should be
15 paid when a program is broadcast.

The user terminal 202 may be a television, a set top terminal 206, a personal computer terminal 211 (see Figure 3), or any device capable of receiving digital or analog data, or some combination thereof. The user terminal 202 may be equipped with user input devices 214 that communicate search criteria to the system 200 as well as navigate through the user terminal menu system and control the user terminal's other various functions. The user local storage 212 is used to store and archive content onto one or more removable and/or non-removable storage devices or media for later access. Removable storage media may include, but is not limited to, magnetic tape, magnetic disks, optical disks and modules, and electronic memory cartridges. The user local database 213 is the repository of all relevant information about a user's profile and account. The user profile and account information includes, but is not limited to, user name, password, personal information that the user has authorized for storage, billing information, other users allowed access to the account, past search criteria, past content download information, and library information about stored content. As a consumer protection, the user terminal 202 may enable the account user to view the information stored in the user local database 213 and modify certain data fields and select which data fields may be reported to a main system database within the aggregator

1 201. Certain fields including, but not limited to, account numbers and billing information
2 may not be allowed this level of user access.

3 The user terminal processor 227 may include a central processing unit and all
4 associated hardware, software, and firmware modules to perform all operations within the
5 user terminal 202. These operations include, but are not limited to, managing
6 communications with the aggregator 201 and other networked devices, processing search and
7 download requests, displaying search and download results, managing and controlling
8 communications with the user local storage 212 and the user local database 213, responding
9 to user interaction with presentation of graphical user interface (GUI) menus, playing out
10 selected programming content using various audio and video output devices, implementing
11 the user's part of the digital rights management schema, and administering the user's account
12 and billing. The tuner 228 and the demultiplexer 231 are used to select an audio/video
13 channel for playout from the channels available on one or more cable television system 216
14 and/or other delivery systems such as a satellite system and/or off-air broadcast receiver.
15 The term "off-air" is used to indicate that the broadcast signal can be received over the public
16 airwaves with the use of an appropriate antenna.

17 In an embodiment, the user terminal 202 may incorporate selected features of the
18 aggregator 201. For example, the user terminal 202 may include a small metadata crawler,
19 an aggregator, and program content and program metadata storage.

20 The user terminal 202 communicates with the aggregator 201 using the wide area
21 distribution system 203. Within the aggregator 201, the communications server 250 acts as
22 the interface point to the wide area distribution system 203 for the purpose of managing
23 primary communications to system users. The communications server 250 routes incoming
24 user requests and associated user information to the request and results processing server
25 300, routes search results and content downloads through the wide area distribution system
26 203 to end users, and routes billing information to the end users from a customer billing
27 server within the system administrator 500. The request and results processing server 300
28 performs the basic processing and routing related to user search requests, content download
29 requests, administrative information requests, search results, related content suggestions, and
30 programming notification.

Figure 5 shows individual subsystems of the request and results processing server 300. The types of requests from a system user include, but are not limited to, programming and other content search requests, content download requests based on results of an earlier search, and administrative information requests. Requests for administrative information may be automatically generated by the user terminal 202 or may be manually initiated by the system user. When an administrative request is received, a request receiver and router 301 opens a dialog with a database administrator 502 (see Figure 8) within the system administrator 500, retrieves the requested system user's administrative data, and routes the data through the communications server 250 to the user terminal 202. Search requests and content download requests are routed to a search request processor 303 and a content download request processor 302, respectively. The processors 302 and 303 open a dialog with the database administrator 502 and verify that the user's request is authorized. If the user's request is not authorized, the processor (302 or 303) sends a message to the user through the request receiver and router 301 and the communications server 250 informing the user that the request is denied. The processor (302 or 303) then logs the event with the system administrator 500. If the request is authorized, the processor (302 or 303) formats the request as necessary and routes content download requests to the content acquisition server 400 and search requests to the search engine server 350.

For programming download requests, the content acquisition server 400 submits scheduling and availability information about the selected content to the database administrator 502 within the system administrator 500, which in turn routes this scheduling and availability information to a scheduled program and content availability prompt and notification processor 306 within the request and results processing server 300. The scheduled program and content availability prompt and notification processor 306 then initiates a form of prompt and/or notification to the user that the selected content is available at a particular time. This notification can be in various forms including, but not limited to, an on-screen pop-up window, audible notification, e-mail notification, instant message, and automated telephone notification. The exact form and timing of the prompt and/or notification may be customized by the user and may be based on whether the content is scheduled, continuously broadcast, stored, or available any time for download. In an embodiment, when a selected program is about to be broadcast or made available for viewing

on television, a prompt will be sent by the server 300 notifying the user when the program is about to air. In the case of an on-screen prompt, a mechanism may be provided for enabling the user to hyperlink to the selected program from the prompt. For search requests, the search engine server 350 returns a data package to the request and results processing server 300 that contains scheduling, availability, and descriptive information about all content entries that have been determined to satisfy the search criteria.

In addition to searching for content containing criteria entered by a system user, a content search suggestion engine 304, in conjunction with the search engine server 350 will be able to suggest content to the user that is related in various ways, such as by category or theme. The content search suggestion engine 304 is shown in detail in Figure 6. For example, if a user wishes to see programs about *Titanic*, the content search suggestion engine 304 may, in addition to suggesting programs about *Titanic*, suggest or inform the user of programs and other content such as electronic books about ships other than *Titanic*. Likewise, if the search criteria include Johnny Weismuller, an actor who starred in Tarzan movies, the content search suggestion engine 304 might suggest programs and other content about Tarzan featuring someone other than Johnny Weismuller. Furthermore, the content search suggestion engine 304 may suggest programs for viewing based on past search criteria entered by the user as well as information on content the user has actually downloaded. For example, if the search criteria includes Johnny Weismuller and the user has searched and/or downloaded numerous sports-related programming in the past, the content search suggestion engine 304 may suggest programming and other content including swimming competitions and sports history and biography programming as well as Tarzan movies and other content directly related to Johnny Weismuller such as the Jungle Patrol television series. If the user searched for and received Tarzan movies, the content search suggestion engine 304 might suggest electronic books by Edgar Rice Burroughs. Such electronic books could then be downloaded to the user terminal 202 using the wide area network/Intranet 205 bypassing the aggregator 201, or could be compiled at the aggregator 201 for delivery to the user terminal 202. Electronic book delivery systems are described in U.S. Patent 5,986,690, entitled "Electronic Book Selection and Delivery System," to Hendricks, and in co-pending patent application serial numbers 09/289,957, entitled "Electronic Book Alternative Delivery Systems," and 09/289,956, entitled "Electronic Book Alternative Delivery Methods," all of

which are hereby incorporated by reference. The content suggestion function of the aggregator is described in more detail in co-pending patent applications entitled "Video and Digital Multimedia Aggregator" and patent application entitled "Video and Digital Multimedia Aggregator Content Suggestion Engine," filed on August 3, 2001, which are incorporated by reference.

Returning to Figure 5, all search results, based on user search criteria and suggested search criteria, may be forwarded by the search engine server 350 and then to the search results form builder 305 within the request and results processing server 300. The search results form builder 305 formats the results for transmission through the communications server 250 to the user terminal 202. The search results form builder 305 takes prioritized lists of user search results and suggested search results and populates a search results form with programming, scheduling and availability information. The request and results processing server 300 then encrypts and forwards the search results form 674 through the communications server 250 to the user terminal 202. At the user terminal 202, the search results form 674 is decrypted and stored in the user local database 213 and a prompt is displayed that allows the user to display the returned results on the video display system 207 or the electronic book reader 230.

The search results can then be displayed on the user's video display system 207 in various formats including, but not limited to, a hierarchical listing based on relevance to search criteria and a display similar to an electronic program guide based on time of availability and content source. The user will be able to select from the various results display formats and have the results data be reformatted upon request. In an embodiment, the user may be able to select one of the search criteria or an attribute of the programming and the results will be sorted based on that selection. For example, if numerous program types are returned, the user can select "documentaries" and the results will be listed with documentary programs occurring first. The results display will also indicate whether a particular programming choice is a result of the user-defined search criteria or was a result of the system's capability to suggest content. The user will have the ability to display only results from the user search, only results from the suggested content search, or both. In an embodiment, the entire menu system can be implemented using audible prompts and lists in order to accommodate users with visual impairments. In such a scenario, input methods can

be by voice recognition, tactile recognition such as a remote control equipped with a Braille character input pad, or a combination of these methods.

As shown in Figure 4, the network gateway 251 serves as the communications system between the aggregator 201 and the wide area network/Internet 205, and hence the remote content server 204. The network gateway 251 may support any protocol in widespread use for connection to the wide area network/Internet 205 and may also serve as a security firewall between the aggregator 201 and the wide area network/Internet 205. The network gateway 251 will route search and content download information from the aggregator 201 to one or more remote content servers 204 and route search results and content from the remote content server 204 and other Internet sources back to the aggregator 201.

The content acquisition server 400, as shown in detail in Figure 6, receives content download requests from the request and results processing server 300. The content acquisition server 400 includes a content request processor and router 401 and a remote content download processor 402. A download request is made by the user for content selections from sources including, but not limited to, earlier programming searches, recurring scheduled events, an electronic program guide, lists of electronic books and computer software, advertisements, promotions, and affiliated Internet websites. In general, a download request will be accompanied by data indicating the source of the content and whether the content is local or remote. Requests for content that is available only from a remote site may be routed to the network gateway 251 and then to the appropriate remote source. Remote sources include, but are not limited to, the remote content storage 258 and the remote streaming sources 259 shown in Figure 4. The remote content server 204 verifies the request and returns the content through the wide area network/Internet 205. If the programming content is in the appropriate format and is authorized for direct delivery to the user, the content may be routed through the wide area network/Internet 205 and the wide area distribution system 203 directly to the user terminal 202. During this transfer, administrative data pertaining to billing and verification of delivery may be sent back to the aggregator 201.

Programming that is not formatted and authorized for direct delivery from a remote source may be transmitted through the network gateway 251 to the remote content download processor 402 contained within the content acquisition server 400. The remote content download processor 402 buffers or caches the programming content while managing the

download connection to the remote source. The programming content is then routed to the decoder and content formatter 252, which may be capable of decoding various industry formats and compression schemes and may reformat and encode the decoded data and associated metadata into one or more preferred content formats for delivery and for local storage. The processed programming content, along with user identification and routing data, is then routed to the content delivery server 450, which then manages the delivery of the content through the communications server 250 and wide area distribution system 203 to the user terminal 202. The content delivery server 450 is shown in detail in Figure 7.

Requests for programming available from a local source are routed directly to a local content request processor 451 within the content delivery server 450. The local content request processor 451 initiates delivery of content from local sources including, but not limited to, the aggregator local storage 254 and aggregator local streaming sources 262, and routes the content to the coder and file formatter 253. In an embodiment, the local streaming sources 262 can include any of the cable television channels available at the cable television system headend 210 housing the aggregator 201. If the programming content is not already in the user-requested format and coding scheme, the coder and content formatter 253 (see Figure 4) performs content formatting and coding of the programming for delivery to the user. The content is then forwarded to a content delivery processor 453, which manages the delivery of the content through the communications server 250 and wide area distribution system 203 to the user terminal 202.

During the content acquisition and delivery process, the content delivery processor 453 may oversee and validate that the delivered programming content matches the original content download request. This may be done by receiving program and user metadata from the content acquisition server 400 through the local content request processor 451 and comparing the received data to the metadata of the actual requested content and the actual delivered content as received during the program request and download process. A confirmation may then be logged with the system administrator 500. In an embodiment, based on user information and content metadata, the content delivery processor 453 may command an advertisement processor 456 to insert specific advertising into certain programming content as it is delivered to a system user. The advertising can be retrieved from the aggregator local storage 254 or can already be resident at the user terminal 202.

1 Methods for targeting advertisements to users are described in co-pending patent applications
2 Serial No. 09/054,419, entitled "Targeted Advertising Using Television Delivery Systems,"
3 and Serial No. 08/160,280, entitled "Method and Apparatus for Targeted Advertising," both
4 of which are hereby incorporated by reference. Confirmation of the programming delivery is
5 also sent to the database administrator 502 for logging into the aggregator local database 501.

6 Similarly, if content is copyright protected and the user is granted certain rights and
7 denied others for use of copyright protected content, the content delivery processor 453 may
8 command a digital rights management processor 454 to implement a digital rights
9 management (DRM) scheme. The DRM scheme controls how digital content is used,
10 including, but not limited to, whether or not the content can be stored on the user terminal
11 202, copied to another system, forwarded to another user, transferred to removable media, or
12 translated into a different digital file format or coding scheme. The DRM scheme may be
13 able to make use of digital encryption technology to enforce copyright protection if
14 necessary. When this is the case, the digital rights management processor 454 will command
15 the content delivery processor 453 to route the subject programming content along with
16 encryption data to an encryption processor 455. The encryption processor 455 encrypts the
17 programming content and returns the content to the content delivery processor 453 for
18 transmission to the end user. Under this type of scenario, the authorized user terminal 202
19 will possess the necessary information to decrypt and output the programming content. The
20 user terminal 202 will also contain the necessary information to enforce any DRM scheme
21 that has been applied to a particular piece of content.

22 During the delivery of programming content other than broadcast programming over
23 the concatenated cable television system 216, the user terminal 202 may continuously
24 respond to the content delivery processor 453 identifying the user terminal 202, verifying that
25 the appropriate data is being delivered, and indicating that the delivery should continue. If
26 the download is terminated by the user, the user terminal 202 may inform the content
27 delivery processor 453, which then terminates the delivery.

28 Upon successful delivery of the requested programming, the content delivery server
29 450 logs the results with a customer billing server 506 and content fee and copyright billing
30 server 507 within the system administrator 500 (not shown in Figure 4). The customer
31 billing server 506 determines if the content delivery requires additional charges to the

In an embodiment, the user terminal 202, whether it is comprised of a set top terminal 206, a personal computer terminal 211, or some combination thereof, is integrated into a home network 229 serving the user's home. This will enable the consumption of programming content at numerous nodes in the home which may consist of auxiliary user terminals and/or personal computers with various combinations of video display system 207, audio playout system 208, and audio/video recording system 209. The primary user terminal 202 can route programming search and download requests from other network nodes and route subsequent downloaded programming to the requesting node either on a baseband video network or a digital data network such as an Ethernet network. Auxiliary nodes may also have a combination of user input devices 214 to control the system and initiate programming requests and downloads. In an embodiment, a handheld remote control 225 using wireless radio frequency transmission may control the primary user terminal 202 from a remote location to deliver programming to a remote video display system 207.

Once a download request has been processed and authorized, the content download request process creates either an authorized remote download request form 768 or an

1 authorized local download request form 769 and forwards the authorized download request to
2 the content delivery server 450, which fulfills delivery of the content using the basic content
3 delivery process 800 shown in Figures 9A, 9B and 9C. As an authorized remote download
4 request form 768 or an authorized local download request form 769 is received, the content
5 delivery server 450 determines, routine 801, if the request is local or remote, and routes the
6 request form appropriately (routine 802 for a remote request and routine 819 for a local
7 request).

8 If the request is to be fulfilled remotely, execution of the routine 802 transmits a
9 message to the remote content server 204 to begin delivery of the programming content. In
10 routine 803, the download request is analyzed and the remote content server 204 determines
11 if the content can be delivered directly to the user without going back through the aggregator
12 201. If the content is not designated for delivery directly to the user, routine 804 is executed,
13 which establishes a communications link with the main content acquisition server 400
14 through the network gateway 251 and starts transmitting the requested programming. In the
15 case of programming that is airing in real-time, the programming can be in the form of an
16 audio/video stream from various remote streaming sources 259. Non-real-time programming
17 can be in the form of compressed audio/video files delivered from remote content storage
18 258. When the content delivery process commences, execution of routine 806 initiates a
19 process in the system administrator 500 that analyzes the content metadata and determines if
20 the programming should be stored at the aggregator local storage 254. The system
21 administrator 500 may determine to store a particular program locally based on reasons
22 including, but not limited to, the program being a live event such as a sports event or a
23 musical concert that will likely be requested for download in the future. Alternatively, the
24 programming is not stored locally and the current request represents a predetermined number
25 of users that have requested the content requiring remote delivery.

26 If the programming being delivered from a remote content server 204 will be stored
27 to the aggregator local storage 254, the programming metadata is analyzed (routine 807) to
28 determine if the content is in an acceptable format for local storage. The aggregator 201 may
29 be configured to store content in one or more specific formats that will balance the highest
30 quality of programming content to be delivered to the users versus available storage space.
31 In an embodiment, one or more of the selected storage formats will make the most efficient

1 use of the aggregator local storage 254 resources as well as support high-speed delivery to
 2 system users. If the content is determined to meet the format requirements for local storage,
 3 processing passes on to routine 810. If the content does not meet the format requirements,
 4 the content stream and/or files are routed to the decoder and content formatter 252, routine
 5 808. At routine 809, the decoder and content formatter 252 decodes the incoming data and
 6 may extract digital and/or analog data representing the content and its metadata. The decoder
 7 and content formatter 252 then reformats the content into the required formats and coding
 8 schemes for local storage. Upon execution of storage routine 810, the properly formatted
 9 programming content is stored to the aggregator local storage 254. The process and the new
 10 location of the content is then logged into the aggregator local database 501.

11 Whether or not the content was stored locally, routine 811 analyzes the programming
 12 content's metadata and determines if the content is in the appropriate format and coding
 13 scheme for delivery to the user. The format and coding scheme for delivery may be different
 14 from that used for local storage in order to accommodate particular parameters of a user's
 15 download request. The user may request specific formats and coding schemes due to
 16 considerations including, but not limited to, the method of playback, the type of
 17 programming, whether the user intends to store the content, or the type and bandwidth of the
 18 connection the user terminal 202 has to the aggregator 201 or the remote content server 204.
 19 If the content is determined to meet the format requirements for delivery to the user,
 20 processing moves to routine 814. If the content does not meet the format criteria, the content
 21 stream and/or files are routed to the decoder and content formatter 252 by (routine 812) along
 22 with the required formatting and coding parameters. At routine 813, the decoder and content
 23 formatter 252 decodes the incoming data and may extract digital and/or analog data
 24 representing the content and its metadata. The decoder and content formatter 252 then
 25 reformats the content into the required formats and coding schemes for delivery to the user.
 26 Processing then moves to routine 823 for delivery, which is discussed below when that
 27 processing path becomes common to both remote and local content delivery.

28 Returning to block 803 in Figure 9A, if the programming content is designated for
 29 direct delivery to the user's terminal, the remote content server 204 establishes a
 30 communications link with the user terminal 202 (routine 815) and delivers the content files or
 31 streams the broadcast program directly to the user terminal 202 (routine 816). After the

completed delivery is validated during routine 816, routine 817 logs the delivery fulfillment in the remote server database 260 and notifies the content acquisition server 400 at the aggregator 201 that the requested programming content has been successfully delivered to the user. Processing is then moved to the system administrator 500 (routine 828), which is discussed below, when that processing path becomes common to each delivery type.

If the programming download request is to be fulfilled by the local aggregator 201, execution of the routine 801 passes processing to routine 819 in the local content request processor 451 of the content delivery server 450, which analyzes the programming content's metadata and determines if the content is in the appropriate format and coding scheme for delivery to the user. If the content is determined to meet the format requirements for delivery to the user, processing moves to routine 822. If the format and coding scheme is not correct, execution of the routine 820 retrieves the programming content from the aggregator local storage 254 or the appropriate local streaming sources 262 and routes the programming to the decoder and content formatter 252 along with the required formatting and coding parameters. In routine 821, the decoder and content formatter 252 decodes the incoming data and may extract digital and/or analog data representing the content and its metadata. The decoder and content formatter 252 then reformats the content into the required formats and coding schemes for delivery to the user. Execution of routine 822 takes the correctly coded and formatted programming content file(s) and/or streams, whether directly from local sources or from the decoder and content formatter 252, and routes this content to the content delivery server 450.

Whether the programming content is being delivered by the local aggregator 201 from a remote source or a local source, upon execution of routine 823, the content delivery server 450 analyzes the user's profile information and the content metadata and, if applicable, instructs the digital rights management processor 454 to apply the appropriate DRM scheme to the content delivery. If the DRM scheme involves encrypting the programming content for delivery, the programming content is routed to the encryption processor 455, which processes the digital content data through an encryption algorithm using the appropriate user encryption key and routes the encrypted data back to the content delivery server 450.

1 The content delivery server 450 then analyzes the metadata and user information,
2 routine 824 and, if applicable, instructs the advertisement processor 456 to incorporate any
3 advertising into the delivery that is appropriate. The advertising is then retrieved from the
4 aggregator local database 501 and packaged with the programming content delivery. In an
5 embodiment, the advertisement processor 456 may have already delivered particular
6 advertising to the user terminal 202 for storage, and having determined this from the user
7 data, may insert a placeholder for an advertisement that will instruct the user terminal 202 to
8 retrieve and display the advertisement at the appropriate time.

9 Upon execution of routine 825, the content delivery server 450 instructs the
10 communications server 250 to establish a communications link with the user terminal 202
11 through the wide area distribution system 203, initiating a content reception process 850.
12 The content delivery processor 453 delivers the content to the user terminal 202 (routine 826)
13 through the communications server 250 and wide area distribution system 203. Execution of
14 routine 827 verifies the correct delivery of the programming content to the user, and when
15 the delivery is complete, logs the successful delivery with the system administrator 500. The
16 delivery of content may be done in real-time in the case of broadcast programs and live or
17 scheduled program streams or can be done in non-real-time where the content may be
18 delivered at a rate higher or lower than that required for real-time viewing and is stored by
19 the user terminal 202 for playback at a time chosen by the user. (See DAVIC 1.5
20 Specifications, TV Anytime and TV Anywhere, Revision 6.0; copyright Digital Audio-
21 Visual Council (DAVIC), hereby incorporated by reference, for more detail about concurrent
22 viewing and storing, non-linear playback, non-real-time delivery, and content storage and
23 management.)

24 Whether the programming was delivered by the local aggregator 201 or by a remote
25 content server 204, processing moves to routine 828 in the system administrator 500, which
26 analyzes the user profile and the content metadata to determine whether the user will be
27 billed or if the content provider is due a fee for the content delivery. If no bills are due,
28 processing ends, routine 829. If billing or fees are applicable, routine 830 routes user
29 information, appropriate content metadata, and content provider information to the system
30 administrator 500, which enters this data into the billing process represented by routine 900.

Prior to content delivery, the programming content may be processed by the coder and content formatter 253 if required to deliver the content in an appropriate digital coding scheme, compression, and file format to the user. The coder and content formatter 253 employs digital compression techniques to increase existing transmission capacity. A number of digital compression algorithms currently exist or may be developed in the future that can achieve the resultant increase in capacity and improved signal quality desired for the system 200. The algorithms generally use one or more of three basic digital compression techniques: (1) within-frame (intraframe) compression, (2) frame-to-frame (interframe) compression, and (3) within carrier compression or a combination of two or more techniques. The coder and content formatter 253 of the content search, packaging, and delivery system 200 may be able to use any one or combination of two or more of these techniques in addition to being able to have its capabilities modularly expanded to include any emerging and future techniques that are determined to be desirable.

In an embodiment, although a single digital compression standard may be used for the delivery system 200, different levels of compression can be utilized when delivering programs to a user requesting a particular program. For example, if the program is sent out using an HDTV format, then less compression is used as opposed to sending out the program using a standard video format. The reason is that the HDTV format requires more digital data per portion of content. Since the HDTV format requires more digital data, it will also require more bandwidth to transmit, possibly increasing the cost of delivery. Therefore, the quality of the video delivered may be a variable in the fees charged to users of the system 200.

Figure 10 shows the component systems of an alternate embodiment of the aggregator 201 that emphasizes the content acquisition and content delivery functions of the content search, packaging, and delivery system 200. In this embodiment of the aggregator 201, acquisition of remote content is executed by a content acquisition system 405 and delivery of content to system users is accomplished by a content delivery system 460 operating in conjunction with the communications system 280. Also in this embodiment of the aggregator 201, the one or more remote content servers 204 and remote databases 261 connected through the wide area network/Internet 205 to the network gateway 251 (see Figure 4) may be included in the remote content sources 410. The aggregator local storage

254 and local streaming sources 262 may be included in the local content sources 470. Although not shown in Figure 10, the user terminal 202 comprises one or more of a user terminal processor 227, a tuner 228, a demultiplexer 231, user local storage 212, and user local database 213 (see Figure 4). The user terminal 202 may be coupled to a home network 229 and to input and output systems 233 comprising user input devices 214, a video display system 207, and audio playout system 208, and audio/video recording system 209, and an electronic book reader 230 as shown in Figure 4. The decoder and content formatter 252 and the coder and content formatter 253 shown in Figure 4 may be similar or identical in functionality, software configuration, and/or hardware configuration. In an embodiment, the decoder and content formatter 252 and the coder and content formatter 253 may be embodied by a single subsystem represented by a codec and content formatter 270 as shown in Figure 10. In another embodiment, the decoder and content formatter 252 and the coder and content formatter 253 may each comprise one or more separate codec and content formatters 270.

Figure 11 shows the components of the content acquisition system 405, which may comprise the content acquisition server 400, one or more content acquisition routers 406, and one or more content acquisition receiver systems 408. Figure 11 also shows components with which the content acquisition system 405 interacts as part of the content search, packaging, and delivery system 200. The one or more content acquisition receiver systems 408 may further be comprised of one or more acquisition receivers 411, acquisition demodulators 412, and acquisition demultiplexers 413. The content acquisition server 400 may comprise the same components as shown in Figure 6 and may perform the same functions as described earlier in reference to Figure 6 with the addition of interfacing with and controlling one or more content acquisition routers 406, one or more components of the content acquisition receiver systems 408, and communicating with a content delivery system 460 and one or more remote content source 410 systems. Content may be obtained from other similar aggregator systems connected to the wide area network / Internet 205 and/or through one or more of various remote communications channels 409 and are designated as remote aggregator systems 240, as shown in Figure 11. Also, as described earlier, the content acquisition server 400 may acquire content from remote content servers 204 through the network gateway 251 connected to the wide area network / Internet 205 and/or through one or more of various remote communications channels 409. Another remote source of

content may be one or more remote cable television headends 421 that may consolidate various programming content sources and that may be connected to the content acquisition receiver systems 408 through a coaxial cable system or other appropriate means that may comprise one or more of the remote communications channels 409. The remote content sources 410 may comprise one or more remote consolidation systems 415, remote content servers 204, remote aggregator systems 240, and remote cable television headends 421.

The content acquisition receiver systems 408 receive remote content from one or more remote content consolidation systems 415 through one or more remote communications channels 409 and/or through the network gateway 251 and the wide area network/Internet 205. Receipt of remote content may be in response to content download requests transmitted by the content acquisition server 400 to one or more remote consolidation systems 415, one or more remote content servers 204, one or more remote aggregator systems 240, and/or one or more remote cable television headends 421. The remote communications channels 409 comprise various transmission paths and/or communications systems that may connect one or more content acquisition receiver systems 408 to one or more remote content sources 410. The remote communications channels 409 may include one or more, or a combination of two or more, microwave systems, satellite systems, optical systems, wide area network and/or Internet systems, coaxial cable systems, telephone systems, wireline systems, and/or wireless systems.

The remote communications channels 409 may comprise any communications infrastructure system capable of transmitting desired content from the remote content sources 410 to the content acquisition system 405 whether the content is analog and/or digital audio, analog and/or digital video, multimedia data, textual data, or other content types or formats that may be compatible with the content search, packaging, and delivery system 200. The remote communications channels 409 may connect the content acquisition system 405 to one or more remote content sources 410 and/or collections of remote content sources 410 that may be distributed over a wide geographic area. Any particular group of remote content sources 410 may contain only one of the indicated systems included in Figure 11 or may contain any combination of two or more of the indicated systems. The systems supporting the remote communications channels 409 may be scalable in order to be able to support yet-to-be-developed transmission protocols and methods and may be assigned dynamically as

receivers 411, which may receive the electronic signals from one or more communications channels and route these signals to one or more acquisition demodulators 412. The acquisition demodulators 412 may act on the received electronic signals in order to filter analog and/or digital content data streams from one or more modulated carriers using one or more modulation schemes. The demodulated signals may then be sent to one or more acquisition demultiplexers 413 that may separate elementary streams or individual channels of content data from one or more multi-channel streams. The content data streams may then be sent to one or more content acquisition routers 406 in order to be routed to one of more codec and content formatters 270 and/or the content delivery server 450 as required. The content acquisition server 400 may manage and control one or more of the subsystems of the content acquisition receiver systems 408. In an embodiment, two or more of the functions performed by components within the content acquisition receiver systems 408 may be performed within a single piece of equipment or group of equipment so that a discrete component may not be necessary to perform each step or function of the content reception process. The content acquisition server 400 may communicate with one or more of the subsystems of the content acquisition receiver systems 408 to identify and manage available receiver system 408 resources, configure receiver system 408 hardware and/or software parameters for reception, demodulation, and demultiplexing operations, and to transmit routing information and operational parameters necessary for the content acquisition receiver systems 408 to receive, demodulate, and demultiplex content from various sources. The content acquisition server 400 may also communicate with one or more content acquisition routers 406 in order to transmit routing connection parameters and paths for the transfer of content data between various subsystems of the content acquisition receiver systems 408 and the appropriate subsystems of one or more codec and content formatters 270 and/or the content delivery server 450 contained within the content delivery system 460.

The content acquisition server 400 may use one or more of the content acquisition routers 406 to dynamically establish logical and/or physical circuit connections for transmission of content data between the various subsystems shown in Figure 11. A content acquisition router 406 may comprise one or more hardware systems and one or more software modules that may operate under the direction of the content acquisition server 400 to establish and manage the interconnections between subsystems required to transfer content

in support of one or more receiving, demodulating, and/or demultiplexing operations. In Figure 11, several of the interconnections between subsystems are shown as two connection lines and a series of dots between the two lines. This convention is used in several of the supporting drawings and indicates that at any time there may exist one or more connections or circuits between one or more of the connected subsystems and that between two connected subsystems the number of connections may vary. Each collection of connections or circuits may comprise one or more logical and/or one or more physical connections between software and/or hardware modules. Physical routing configurations, such as may be required for the transfer of analog content, may be achieved using one or more industry standard and/or custom components such as circuit switching devices, matrix switches, distribution amplifiers, signal splitters, input and output ports, and patch bays. Logical routing, such as may be required for the transfer of digital content, may be achieved using one or more digital packet transport protocols that may operate on one or more local area networks supported by the content acquisition server 400 and/or the system administrator 500 as part of the content search, packaging, and delivery system 200. In an embodiment, the functionality of the content acquisition routers 406 may be implemented by one or more subsystems and may be functionally and/or physically external to the content acquisition system 405 and may be a subsystem (not shown in Figure 4) of the aggregator 201. In another embodiment, the functionality of the content acquisition routers 406 may be implemented by one or more subsystems and may be functionally and/or physically external to the aggregator 201 so that the aggregator 201 and its subsystems may connect to the content acquisition routers 406, or equivalent systems, through external interfaces (not shown in Figure 4). The number of connections and the logical and physical routing paths of such connections both within the content acquisition system 405 and external to the content acquisition system 405 may be changed as required to accommodate a smaller or larger number of content pathways and to accommodate various source and destination combinations required at any given time. These pathways may be created or modified on a demand basis by the content acquisition server 400 and may be modified prior to and/or during a reception, demodulation, and/or demultiplexing operation as may be required.

If remote content received by the content acquisition system 405 is not in the appropriate format and/or coding scheme for delivery and/or storage, the content may be

The remote content transmission system 440 may include, but is not limited to, to one or more remote content encoders 441, remote content multiplexers 442, remote content modulators 443, and remote content transmitters 445. The inputs of one or more components of the remote content transmission system 440 may receive one or more content files and/or content transport streams from the remote content router 432 and/or directly from one or more remote programming receivers 425. The outputs of one or more remote content transmitters 445 may be connected to one or more remote communications channels 409 for transmission to the content acquisition system 405 within an aggregator 201. The one or more remote content encoders 441 may operate on one or more content files and/or content transport streams to apply one or more proprietary and/or standard formatting and coding schemes. One or more remote content multiplexers 442 may then operate on two or more content signals to combine the signals into a single composite signal to be transmitted over a single channel carrier. One or more content signals, whether encoded and/or multiplexed, may then be operated on by a one or more remote content modulators 443 that modulate the

content data signals onto one or more intermediate and/or carrier frequencies appropriate for transmission over one or more remote communications channels. One or more modulated content signals may then be routed through one or more remote content transmitters 445 for appropriate frequency conversion and/or amplification for injection onto one or more of the remote communications channels 409 that will carry the signal(s) to one or more content acquisition systems 405. In an embodiment, two or more of the functions performed by components within the remote content transmission system 440 may be performed within a single piece of equipment or group of equipment so that a discrete component may not be necessary to perform each step or function of the transmission system process.

Within the remote programming sources 416 shown in Figure 12, the remote television and radio sources 417 may include one or more off-air radio and/or television broadcasts available in any of a large number of geographically diverse markets. The remote satellite sources 418 may include, but are not limited to, audio and/or video signals from content providers using one or more proprietary and/or standard formats such as the direct broadcast satellite (DBS) systems, digital audio radio services (DARS), as well as programming from one or more radio and television distribution services and networks, broadcast network satellite feeds, occasional use video feeds, and other signals distributed by satellite such as distance learning and/or public programming services. The remote microwave sources 419 may include one or more audio, video, and/or data services distributed via point-to-point microwave networks and may comprise single content signals such as a regional television signal or may comprise a multiplex of two or more analog and/or digital content source signals. The remote audio and video studios 420 may include one or more of various radio- and/or television-based studios as well as other audio and video studios that may provide one or more digital and/or analog content feeds. The remote studios 420 may include live on-site broadcasts such as sporting events and/or news event coverage. The remote physical media playout systems 422 may include various audio and/or video systems for playing back programming that resides on physical media including, though not limited to, magnetic tape, optical discs, vinyl records, movie film, and other yet-to-be-developed media for storage and playback of programming content. The content feeds from the remote audio and video studios 420 and from the remote physical media playout systems 422 may be sent to one or more remote audio / video processors, mixers, and/or routers 430

that may perform various processing functions on the audio and video signals of the source content to meet content requirements for transmission. The audio/video processing functions may include adjusting audio levels, combining and/or splitting audio and/or video signals, and adjusting video luminance and chrominance.

Figure 13 shows the components of the content delivery system 460, which may comprise the content delivery server 450, one or more content delivery routers 461, and one or more content delivery receiver systems 463. Figure 13 also shows components with which the content delivery system 460 interacts as part of the content search, packaging, and delivery system 200. The one or more content delivery receiver systems 463 may further comprise one or more local off-air receivers 465, local satellite receivers and decoders 466, local microwave receivers 467, and local audio/video processors, mixers, and/or routers 468. The content delivery server 450 may comprise the same components as shown in Figure 7 and may perform the same functions as described earlier in reference to Figure 7 with the addition of interfacing with and controlling one or more content delivery routers 461, one or more components of the content delivery receiver systems 463, and/or one or more components of the local content sources 475 shown in detail in Figure 14.

In Figure 13, signals containing content that are received from local content sources 475 by one or more content delivery receiver systems 463 may be operated on by one or more receiver systems 463 that may extract one or more baseband content files and/or data streams that may comprise audio, video, and/or other content capable of being delivered by the aggregator 201. The content data may then be sent to one or more content delivery routers 461 in order to be routed to one of more codec and content formatters 270, the content delivery server 450, and/or the communications system 280 as required. The content delivery server 450 may manage and control one or more of the subsystems of the content delivery receiver systems 463 and the local content sources. The content delivery server 450 may communicate with one or more of the subsystems of the content delivery receiver systems 463 to identify and manage available receiver system 463 resources, configure receiver system 463 hardware and/or software modules, and to transmit routing information and operational parameters necessary for the content delivery receiver systems 463 to receive, demodulate, demultiplex, and process content from various local content sources 475. The content delivery server 450 may communicate with one or more of the components

of the local content sources 475 in order to identify and access the desired local content data, identify and manage available local content resources, configure local content source 475 hardware and/or software modules, and to transmit routing information and operational parameters. The content delivery server 450 may also communicate with one or more content delivery routers 461 in order to transmit routing connection parameters and paths for the transfer of content data between various subsystems of the content delivery receiver systems 463 and the appropriate subsystems of one or more codec and content formatters 270 and/or the communications system 280.

If local content accessed by the content delivery system 460 is not in the appropriate format and/or coding scheme for delivery, the content may be routed to one or more codec and content formatters 270 for appropriate processing. The codec and content formatters 270 are described in more detail in co-pending U.S. patent application entitled "Video and Digital Multimedia Aggregator Content And Coding Formatting," filed on date herein. If local content accessed by the content delivery system 460 is in an appropriate format and/or coding scheme for delivery, then the one or more remote content files and/or transport streams containing the local content may be routed to the communications system 280 for transmission to one or more end users as appropriate.

One or more content files and/or content data streams to be delivered to one or more system users may be designated for processing by the content delivery server 450 to apply other services to the content data such as digital rights management, encryption, and/or advertising. Content designated for digital rights management processing, encryption, and/or addition of advertisement data may be routed by one or more content delivery routers 461 to the content delivery server 450 prior to routing to the communications systems 280 for deliver to system users. Within the content delivery server 450, these services may be incorporated with the content data as described earlier in reference to Figure 7 by a digital rights management processor 454, an encryption processor 455, and/or an advertisement processor 456 and may be applied to content whether the content source is local or remote. After the application of designated services, the content delivery server 450 may then route the processed content data back to one or more content delivery routers 461 for forwarding to the communications system 280. The content delivery server 450 may incorporate metadata and/or other user information concerning applied services with the content data or in a

1 separately transmitted file or data stream for forwarding to one or more user terminals 202 by
2 the communications system 280.

3 The content delivery server 400 may use one or more of the content delivery routers
4 461 to dynamically establish logical and/or physical circuit connections for transmission of
5 content data between the various subsystems shown in Figure 13. A content delivery router
6 461 may comprise one or more hardware systems and one or more software modules that
7 may operate under the direction of the content delivery server 400 to establish and manage
8 the interconnections between subsystems required to transfer content in support of one or
9 more receiving, demodulating, and/or demultiplexing operations. In Figure 13, several of the
10 interconnections between subsystems are shown as two connection lines and a series of dots
11 between the two lines indicating that at any time there may exist one or more connections or
12 circuits between one or more of the connected subsystems and that between two connected
13 subsystems the number of connections may vary. Each collection of connections or circuits
14 may comprise one or more logical and/or one or more physical connections between software
15 and/or hardware modules. Physical routing configurations, such as may be required for the
16 transfer of analog content, may be achieved using one or more industry standard and/or
17 custom components such as circuit switching devices, matrix switches, distribution
18 amplifiers, signal splitters, input and output ports, and patch bays. Logical routing, such as
19 may be required for the transfer of digital content, may be achieved using one or more digital
20 packet transport protocols that may operate on one or more local area networks supported by
21 the content delivery server 450 and/or the system administrator 500 as part of the content
22 search, packaging, and delivery system 200. The number of connections and the logical and
23 physical routing paths of such connections may be changed as required to accommodate a
24 smaller or larger number of content pathways and to accommodate various source and
25 destination combinations required at any given time. These pathways may be created or
26 modified on a demand basis by the content delivery server 450 and may be modified prior to
27 and/or during a reception, demodulation, and/or demultiplexing operation as may be
28 required.

29 As shown in Figure 14, local content sources 475 may include, but are not limited to,
30 one or more local television and radio sources 477, local satellite sources 478, local
31 microwave sources 479, local audio and/or video payout servers 481 that may be connected

to the aggregator local storage 254, local audio and video studios 482, and local physical media playout systems 483, and local cable television headends 484. As shown in Figure 13, local content delivery receiver systems 463 may include, but are not limited to, local off-air receivers 465, local satellite receivers and decoders 466, local microwave receivers 467, and local audio/video processors, mixers, and/or routers 468. Within the local content sources 475 shown in Figure 14, the local television and radio sources 477 may include one or more off-air radio and/or television broadcasts available in one or more markets that may be geographically adjacent to the aggregator 201 system. The local satellite sources 478 may include, but are not limited to, audio and/or video signals from content providers using one or more proprietary and/or standard formats such as the direct broadcast satellite (DBS) systems, digital audio radio services (DARS), as well as programming from one or more radio and television distribution services and networks, broadcast network satellite feeds, occasional use video feeds, and other signals distributed by satellite such as distance learning and/or public programming services. The local microwave sources 479 may include one or more audio, video, and/or data services distributed via point-to-point microwave networks and may comprise single content signals such as a regional television signal or may comprise a multiplex of two or more analog and/or digital content source signals. The local audio/video playout servers 481 may comprise computer-based systems that can access, on a demand or request basis and/or a scheduled basis, content that may be stored in the aggregator local storage 254. The playout servers 481 may retrieve content data from local storage 254 and may convert the stored data into one or more formats for delivery including, but not limited to, MPEG audio and/or video, internet protocol encapsulated audio and/or video, baseband audio and/or video, and DBS audio and/or video. The local audio and video studios 482 may include one or more of various radio- and/or television-based studios as well as other audio and video studios that may provide one or more digital and/or analog content feeds. The local studios 482 may include live on-site broadcasts such as sporting events and/or news event coverage. The local physical media playout systems 483 may include various audio and/or video systems for playing back programming that resides on physical media including, though not limited to, magnetic tape, optical discs, vinyl records, movie film, and other yet-to-be-developed media for storage and playback of programming content. The local cable television headend 484 may comprise any audio, video, and/or data services

provided by a local cable television system in one or more different formats. The content feeds from the local audio and video studios 482, the local physical media playout systems 422, and/or the local cable television headend 484 may be sent to one or more local audio / video processors, mixers, and/or routers 468 (see Figure 13) that may perform various processing functions on the audio and video signals of the source content to meet content requirements for transmission. The audio/video processing functions may include adjusting audio levels, combining and/or splitting audio and/or video signals, and adjusting video luminance and chrominance.

Figure 15 shows the components of a communications system 280 which may be part of the alternate embodiment of the aggregator 201 shown in Figure 10. Figure 15 also shows components with which the communications system 460 interacts as part of the content search, packaging, and delivery system 200. Within the aggregator 201, the communications system 280 acts as the interface to the wide area distribution system 203 for the purpose of managing primary communications to system users. The communications system 280 may also interact with a request and results processing server 300, a content delivery system 460, and a system administrator 500. The communications system 280 may route incoming user search and download requests and associated user information to the request and results processing server 300, may route search results and content downloads through the wide area distribution system 203 to end users, and may route billing information to and from the customer billing server 506 within the system administrator to and from end users. The communications system 280 may receive content data files and/or content data transport streams from the content delivery system 460 and may transmit these content files and signals through the wide area distribution system 203 to one or more user terminals 202.

As shown in Figure 15, the components of the communications system 280 may comprise the communications server 250, one or more content transmission routers 281, one or more content transmission systems 283, one or more user data transceivers 285, and a physical media production unit 287. The communications server 250 communicates with the content delivery system 460 to coordinate transfer of content data from the content delivery system 460 through one or more content transmission routers 281 to one or more content transmission systems 283 for delivery through the wide area distribution system 203 to one or more user terminals 202. Data transferred between the communications server 250 and

the content delivery system 460 for coordination of content data transmission may include, but is not limited to, content routing parameters and addressing, content format metadata, content size and/or and duration metadata, identification and operational parameters for the target content transmission systems 283, identification and operational parameters for the one or more channels within the wide area distribution system 203 to be used for transmission, and identification and addressing information for the one or more user terminals 202 designated for reception of the content data.

The communications server 250 may use one or more of the content transmission routers 281 to dynamically establish logical and/or physical circuit connections for transmission of content data between the various subsystems shown in Figure 15. A content transmission router 281 may comprise one or more hardware systems and one or more software modules that may operate under the direction of the communications server 250 to establish and manage the interconnections between subsystems required to transfer content from the content delivery system 460 to the content transmission systems 283. In Figure 15, some of the interconnections between subsystems are shown as two connection lines and a series of dots between the two lines. This convention is used to indicate that at any time there may exist one or more connections or circuits between one or more of the connected subsystems and that between two connected subsystems the number of connections may vary. Each collection of connections or circuits may comprise one or more logical and/or one or more physical connections between software and/or hardware modules. Physical routing configurations, such as may be required for the transfer of analog content, may be achieved using one or more industry standard and/or custom components such as circuit switching devices, matrix switches, distribution amplifiers, signal splitters, input and output ports, and patch bays. Logical routing, such as may be required for the transfer of digital content, may be achieved using one or more digital packet transport protocols that may operate on one or more local area networks supported by the communications server 250 and/or the system administrator 500 as part of the content search, packaging, and delivery system 200. In an embodiment, the functionality of the content transmission routers 281 may be implemented by one or more subsystems and may be functionally and/or physically external to the communications system 280 and may be a subsystem (not shown in Figure 4) of the aggregator 201. In another embodiment, the functionality of the content transmission

1 routers 281 may be implemented by one or more subsystems and may be functionally and/or
 2 physically external to the aggregator 201 so that the aggregator 201 and its subsystems may
 3 connect to the content acquisition routers 281, or equivalent systems, through external
 4 interfaces (not shown in Figure 4). The number of connections and the logical and physical
 5 routing paths of such connections both within the communications system 405 and external
 6 to the communications system 405 may be changed as required to accommodate a smaller or
 7 larger number of content pathways and to accommodate various source and destination
 8 combinations required at any given time. These pathways may be created or modified on a
 9 demand basis by the communications server 250 and may be modified prior to and/or during
 10 content transmission as may be required.

11 The communications server 250 may communicate with one or more components
 12 and/or subsystems within the content transmission systems 283 to identify and manage
 13 available content transmission resources, configure content transmission system hardware
 14 and/or software modules, and to transmit routing information and operational parameters
 15 necessary for the content transmission systems to multiplex, modulate, encode, process, and
 16 transmit content through a wide area distribution system 203 to one or more user terminals
 17 202. As shown in more detail in Figure 16, the outputs of the content transmission systems
 18 283 may be coupled to various components and/or subsystems of the wide area distribution
 19 system 203. The wide area distribution system 203 may comprise various communications
 20 systems and/or transmission paths connecting one or more content transmission systems 283
 21 to one or more user terminals 202. The wide area distribution system 203 may include one or
 22 more, or a combination of two or more, coaxial cable television systems, satellite systems,
 23 off-air broadcast channels, optical systems, wide area network and/or Internet systems,
 24 telephone systems, fiber systems, wireline systems, and/or wireless systems. The wide area
 25 distribution system 203 may comprise any communications infrastructure system capable of
 26 transmitting desired content from the communications system 280 within the aggregator 201
 27 to one or more and user terminals 202 whether the content be analog and/or digital audio,
 28 analog and/or digital video, multimedia data, textual data, or other content types or formats
 29 that may be compatible with the content search, packaging, and delivery system 200.

30 Figure 16 shows a representative content transmission system 283 and wide area
 31 distribution system 203. A content transmission system 283 may comprise one or more

content transmission encoders 310, content transmission multiplexers 311, content transmission modulators 312, off-air transmitters 315, satellite transmitters 316, wireless system transmitters 317, cable head end transmitters 318, and digital protocol transmission servers 319. The one or more digital protocol transmission servers 319 may comprise computing systems that are capable of encapsulating content files and data streams into one or more standard and/or proprietary digital protocols for transmission over various cable, fiber, satellite, wireline, and/or wireless circuits. In an embodiment, the digital protocol transmission servers 319 may encapsulate content data into a form of the standard Internet Protocol (IP) for transmission through an IP gateway and associated Internet channels to the user terminals. The wide area distribution system 203 may comprise television and radio broadcast antennas 325, satellite uplink antennas 326, wireless distribution antennas 327, coaxial cable, optical fiber, and twisted pair transmission infrastructure 330, one or more digital protocol transmission gateways 332, and associated communications channels and circuits that connect the content transmission systems 283 to the user terminals 202. In Figure 16, the content transmission router 281 is shown as existing both inside and outside the boundary of the content transmission system 281 to indicate that one or more hardware systems and/or software modules and the associated functions that comprise the content transmission router 281 may be of a distributed nature and therefore may reside partly or wholly within the communications system 280 and/or within one or more of the content transmission systems 283. As such, the functionality of the content transmission router 281 may extend into one or more content transmission systems 283 and may be capable of routing content data and transport streams between one or more of the components and/or subsystems of the content transmission systems 283.

Within the content transmission system 283 one or more content transmission encoders 310 may perform final encoding of content data as may be necessary for transmission by the content transmission system 283 through one or more of the communications channels and/or circuits 335. Encoding performed by the content transmission encoders 310 may include, but is not limited to, scrambling, interleaving, and forward error correction coding such as Reed-Solomon, concatenated, and spread-spectrum coding. Two or more content data signals may be combined by one or more content transmission multiplexers 311 so that multiple content channels and/or signals may be

transmitted simultaneously on a single transmission carrier. Such multiplexed signals may allow the content transmission system to carry numerous programs and/or content downloads through one transmission path to one or more user terminals simultaneously. A multiplexed signal may contain user terminal 202 addressing and authorization data to allow specific user terminals 202 access to desired portions of, or channels within, the multiplexed signal while ignoring content intended for consumption by other user terminals 202. One or more content signals, whether encoded and/or multiplexed, may then be operated on by one or more content transmission modulators 312 that modulate the content data signals onto one or more carrier frequencies appropriate for transmission over one or more communications channels. One or more modulated content signals may then be routed through one or more content transmitters for appropriate frequency conversion and/or amplification for transmission using one or more components of the wide area distribution system 203 that will transmit the signal(s) to one or more user terminals 202. In an embodiment, two or more of the functions performed by components within the content transmission system 283 may be performed within a single piece of equipment or group of equipment so that a discrete component may not be necessary to perform each step or function of the transmission system process.

The wide area distribution system 203 may comprise numerous elements collocated with the communication system 280 of the aggregator 201 as well as distributed public and/or private infrastructure elements and elements that are collocated with one or more user terminals 202. As shown in Figure 16, elements of the wide area distribution system 203 that are collocated with the content transmission systems 283 of the communications system 280 may include one or more television and radio broadcast antennas 325, satellite uplink antennas 326, wireless distribution antennas 327, coaxial cable and/or optical fiber transmission infrastructure 330, and one or more digital protocol transmission gateways 332. Elements of the wide area distribution system 203 that comprise distributed public and/or private infrastructure elements (not shown in Figure 16) may comprise one or more of the physical space representing the public airwaves supporting broadcast, satellite, and wireless transmissions, one or more orbiting communications satellites, and one or one distributed portions of coaxial cable, fiber optic, telephone, and/or twisted-pair wire communications networks. Elements (not shown in Figure 16) of the wide area distribution system 203 that may be collocated with one or more user terminals 202 may include reception elements to

1 receive television and radio broadcast signals, satellite and other wireless transmissions, and
 2 various analog and/or digital signals transmitted over one or more distributed portions of
 3 coaxial cable, fiber optic, telephone, and/or twisted-pair wire communications networks.

4 The content transmission system 283, the wide area distribution system 203, and
 5 reception elements that may be collocated with user terminals may be scalable and
 6 interoperable with a large number of different types of communications systems in order to
 7 provide a high degree of flexibility for transmission of content to system users and may be
 8 able to accommodate integration with yet-to-be-developed broadcast and transmission
 9 systems compatible with distribution of content by the content search, packaging, and
 10 delivery system 200. The communications system 280 in conjunction with the wide area
 11 distribution system 203 may be capable of delivering content over two or more
 12 communications systems and/or paths simultaneously so that a user terminal 202 may be able
 13 to receive content over different communications channels at the same time. The
 14 determination as to what content may be transmitted over which communications system or
 15 path may be determined by the communications system 280 and may be based on factors
 16 including, but not limited to, bandwidth availability among various communications
 17 channels, format and required bandwidth of the content to be delivered, overall system
 18 loading, and source and target locations and/or identities.

19 The communications system 280 may include one or more user data transceivers 285
 20 that comprise software and/or hardware modules that may transmit and receive data other
 21 than content data to and from the aggregator 201 and the user terminals 202. The user data
 22 transceivers 285 may connect the communications server 250 through the wide area
 23 distribution system 203 to one or more user terminals 202 for the transfer of data including
 24 but not limited to, user content search requests and content download requests, notification
 25 prompts regarding requested content availability, user profile data, user history and usage
 26 data, billing information, advertising, programming schedule data, service availability data,
 27 and other administrative information. In an embodiment, the user data transceivers 285 may
 28 comprise one or more computer server systems operably connected to one or more of the
 29 communications channels within the wide area distribution system 203. Transmission of
 30 user data by the user data transceivers 285 from the communications server 250 to one or
 31 more user terminals 202 may be through one or more separate, dedicated communications

1 channels or may be through one or more control and data channels that may occupy the same
2 transmission path as one or more of the content transmissions. In an embodiment, the
3 transmission of user data may be multiplexed with content data. Depending on the type of
4 communications channel used to connect a given user terminal 202 to the communications
5 system 280, the user data transceivers 285 may transmit data directly through one or more
6 components of the wide area distribution system 203, such as one of the digital protocol
7 transmission gateways 332, and/or may transmit data through one of the content transmission
8 systems 283, such as one or more of the satellite transmitters 316 and/or wireless system
9 transmitters 317. In an embodiment, the forward transmission path from the communications
10 system 283 to the user terminal 202 may be different than that of the return transmission path
11 from the user terminal 202 to the communications system 283. For example, a user terminal
12 202 may receive user data, such as the results of a content search, multiplexed with another
13 content download that is delivered using a satellite transmission path and the user terminal
14 202 may upload user data, such as user profile and history data, using an Internet connection
15 through one of the digital protocol transmission gateways 332.

16 Delivery of content to system users may be done through the exchange of physical
17 media such as videotape, digital video disk (DVD), and/or CD-ROM. To support physical
18 media delivery of content, the communications system 280 may encompass a physical media
19 production unit 287 (shown in Figure 16), which may be connected to the communications
20 server 250 to receive instructions and parameters for production of physical content media
21 and which may be connected to the content transmission routers 281 to receive content data
22 to be recorded onto physical media. The physical media production unit 287 may be fully or
23 partially automated and may or may not require human interaction and/or supervision. The
24 communications server 280 may transmit production parameters to the production unit 287
25 including, but not limited to, identification of the content to be recorded onto physical media,
26 the type or physical media to be used, identification information of the system user or users
27 to receive the content on physical media, routing information for the source content data, and
28 packaging and physical delivery information. The content transmission routers 281 may then
29 route the appropriate content data to one or more components of the physical media
30 production unit 287 for recording onto physical media. Physical media for content delivery
31 may include, but is not limited to, magnetic tape, optical disks, removable computer disks,

1 and other yet-to-be-developed media for storage and consumption of programming content.
 2 An example might be a DVD that may contain one or more Tarzan films along with digital
 3 replications of Tarzan movie posters and electronic book versions of the corresponding
 4 novels by Edgar Rice Burroughs. Physical media may be delivered to system users through
 5 the physical media distribution channels 289 shown in Figure 16. The physical media
 6 distribution channels 289 may include the U.S mail, private shipping organizations, one or
 7 more shipping organizations specific to the content search, packaging, and delivery system
 8 200, and/or retail outlets operating under agreement with the operators of the system 200. In
 9 an embodiment, one or more physical media production units 287 may be located remotely
 10 from the aggregator 201 and the communications system 280, such as at a wholesale or retail
 11 location, and may receive production parameters and content data from the communications
 12 server 250 through channels within wide area distribution system 203.

13 Figure 17 is a diagram of processing modules comprising a content acquisition
 14 method 600 that may reside in one or more of the components of a content acquisition system
 15 405 shown in Figure 11, and may control operations of the content acquisition system 405.
 16 The content acquisition method 600 includes a master acquisition system processing module
 17 601 that is coupled to one or more other processing modules within the content acquisition
 18 method 600 and that may manage the configuration and operation of one or more other
 19 processing modules within the content acquisition method 600. The acquisition system
 20 processing module 601 may also be operably connected to and may communicate and
 21 interact with other systems of the aggregator 201 including, but not limited to, a network
 22 gateway 251, a system administrator 500, a request and results processing server 300, a
 23 content delivery system 460, and one or more codec and content formatters 270. In an
 24 embodiment, the processing modules within the content acquisition method 600 may be
 25 interconnected using a bus topology that may allow dynamic interconnectivity between up to
 26 all of the processing modules and may support logical addressing of modules for
 27 communications routing. The master acquisition system processing module 601 may be
 28 coupled to a content request receiver 603 that may communicate with the request and results
 29 processing server 300 and to receive electronic requests for remote content download. The
 30 content request receiver 603 may be coupled to a content request analysis module 605 which
 31 may operate on the content request to identify information within the request that is

necessary to acquire and deliver the requested content. This analysis may include logging of user information, verification of user authorization, identification of requested content and format requirements, and creation and distribution of a list of tasks required to fulfill the download request. The content request analysis module 605 may be coupled to a content download request data routing module 607 that may route and/or transmit appropriate content download request data to one or more remote content sources 410 (see Figure 11) by means of a wide area network (WAN)/Internet gateway interface module 609. The WAN/Internet gateway interface module 609 may interact with a network gateway 251 and may facilitate communications between the content acquisition method 600 and one or more remote content sources 410 through the wide area network/Internet 205.

During the acquisition process, a content scheduling and availability information routing module 611 may submit scheduling and availability information about the selected content to the database administrator 502 within the system administrator 500, which in turn routes this scheduling and availability information to a scheduled program and content availability prompt and notification processor 306 within the request and results processing server 300 (see Figure 5). Also during the acquisition process, a user data and administrative data routing module 613 may route data concerning system users and other administrative processes to one or more processors within the system administrator 500, the content acquisition system 405, and/or one or more user terminals 202. Such user and administrative data may include users search and download request history, billing information, content copyright data, and digital rights management data, and advertising data.

A remote content download management and monitoring module 615 may be coupled to the system processing module 601, the WAN/Internet gateway interface 609, and a remote communications channel configuration and management module 631 to communicate with one or more remote content sources 410 to manage the transfer and/or download of content from remote content sources 410 to the content acquisition system 405. A remote content format and metadata analysis module 617 may compare content format information and metadata associated with remote content against download and/or storage format requirements to determine if the remote content needs to be routed to one or more codec and content for matters 270 prior to delivery to one or more system users and/or storage within the aggregator local storage 254. The format and metadata analysis module 617 may then

1 communicate coding and formatting requirements to the master acquisition system
2 processing module 601 for use in content routing configuration. The system processing
3 module 601 may be coupled to a remote content router configuration and control module 619
4 that may control one or more hardware and/or software components of one or more content
5 acquisition routers 405 to establish and manage logical and/or physical circuit connections
6 for transmission of content data between the various subsystems shown in Figure 11.

7 A remote receive system parameter definition module 621 may be coupled to the
8 system processing 601 and other modules within the content acquisition method 600 and may
9 use download request data and data about available remote content to define remote receive
10 system parameters required for the configuration and control of one or more of content
11 acquisition receiver systems 408. The remote receive system parameters may then be used
12 by the remote receiver system resource polling module 623 to identify required and available
13 receiver system 408 resources to fulfill the content acquisition request. Once receiver system
14 resources have been identified, the remote receiver system configuration module 625 uses
15 resource identification data and receiver system parameters to configure one or more content
16 acquisition receiver systems 408 to receive the requested remote content. After one or more
17 receiver systems 408 have been configured, the remote receiver system management and
18 monitoring module 627 may oversee the receiver systems 408 during the remote content
19 transfer and may communicate with the master acquisition system processing module 601
20 and one or more remote content sources 410 to ensure proper delivery of remote content to
21 the content acquisition system 405 and ultimately through the content acquisition routers 406
22 to the content delivery system 460 and the communications system 280 for transmission to
23 one or more system users.

24 A remote content source parameter definition and transmission module 629 is
25 coupled to the system processing 601 and other modules within the content acquisition
26 method 600 and may use download request data and data about available remote content
27 and/or remote content sources 410 to define configuration and/or operational parameters
28 required by one or more remote content sources 410 to deliver remote content to one or one
29 content acquisition receiver systems 408 and may then transmit these parameters to one or
30 one remote content sources 410. A remote communications channel configuration and
31 management module 631 may be coupled to the master acquisition system processing 601

1 and one or other modules and may use download request data and remote content source
2 parameters and identification data to configure and manage one or more remote
3 communications channels 409 for transmission of remote content to the content acquisition
4 system 405. The remote communications channel configuration and management module
5 631 may also communicate with one or more remote content sources 410 to facilitate
6 configuration of one or more remote communications channels 409 between one or more
7 remote content sources 410 and one or more content acquisition receiver systems 408.

8 A remote content reception module 633 may be coupled to one or more modules
9 within the content acquisition method 600 and may receive signals containing remote content
10 from one or more remote communications channels 409 and may route these signals to a
11 remote content demodulation module 635 that may act on the received electronic signals to
12 filter analog and/or digital content data streams from one or more modulated carriers using
13 one or more modulation schemes. The remote content demodulation module 635 may then
14 route one or more demodulated signals to a remote content demultiplexing module 637 that
15 may separate elementary streams or individual channels of content data from one or more
16 multi-channel streams and may make this data available to the remote content router
17 configuration and control module 619 for transmission to other appropriate subsystems.

18 Figure 18 is a diagram of processing modules comprising a content delivery method
19 700 that may reside in one or more of the components of a content delivery system 460
20 shown in Figure 13, and may control operations of the content delivery system 460. The
21 content delivery method 700 includes a master delivery system processing module 701 that is
22 coupled to one or more other processing modules within the content delivery method 700 and
23 that may manage the configuration and operation of one or more other processing modules
24 within the content delivery method 700. The delivery system processing module 701 may
25 also be operably connected to and may communicate and interact with other systems of the
26 aggregator 201 including, but not limited to, a system administrator 500, a communications
27 system 280, a content acquisition system 405, one or more codec and content formatters 270,
28 and one or more local content sources 475. In an embodiment, the processing modules
29 within the content delivery method 700 may be interconnected using a bus topology that may
30 allow dynamic interconnectivity between up to all of the processing modules and may
31 support logical addressing of modules for communications routing. The master delivery

system processing module 701 may be coupled to a local content request receiver 703 that may receive electronic requests from the request and results processing server 300 (see Figure 5) and/or the content request processor and router 401 (see Figure 6) requesting delivery of locally available content to one or more aggregator 201 system users. The local content request receiver 703 may be coupled to a local content request analysis module 704 which may operate on the local content delivery request to identify information within the request that is necessary to identify one or more local content sources 475 able to provide the requested content and deliver the requested content to one or more system users. The analysis of the local content request may include logging of user information, verification of user authorization, identification of requested content and format requirements, and creation and distribution of a list of tasks required to fulfill the delivery request.

A local content delivery management and monitoring module 707 may be coupled to the system processing module 601 and one or more local content sources 475 to manage the transfer and/or delivery of content from local content sources 475 to the content delivery system 460. A local content format and metadata analysis module 705 may compare format information and metadata associated with the local content against delivery format requirements to determine if the local content needs to be routed to one or more codec and content for matters 270 prior to delivery to one or more system users. The format and metadata analysis module 705 may then communicate coding and formatting requirements to the master delivery system processing module 701 for use in content routing configuration. During the local content delivery process, a user data and administrative data routing module 711 may route data concerning system users and other administrative processes to one or more processors within the system administrator 500, the content delivery system 460, and/or one or more user terminals 202. Such user and administrative data may include user search and download request history, billing information, content copyright data, and digital rights management and advertising data. The system processing module 701 may be coupled to a content delivery router configuration and control module 713 that may control one or more hardware and/or software components of one or more content delivery routers 461 to establish and manage logical and/or physical circuit connections for transmission of content data between the various subsystems shown in Figure 13.

A delivery receiver system parameter definition module 705 may be coupled to the system processing 601 and other modules within the content delivery method 700 and may use download request data and data about available local content to define delivery receiver system parameters required for the configuration and control of one or more of content delivery receiver systems 463. The delivery receiver system parameters may then be used by the delivery receiver system resource polling module 717 to identify required and available delivery receiver system 463 resources to fulfill the content delivery request. Once delivery receiver system resources have been identified, the delivery receiver system configuration module 719 uses resource identification data and delivery receiver systems parameters to configure one or more content delivery receiver systems 463 to receive the requested local content. After one or more delivery receiver systems 463 have been configured, the delivery receiver system management and monitoring module 721 may oversee the receiver systems 463 during the local content transfer and may communicate with the master delivery system processing module 601 and one or more local content sources 475 to ensure proper delivery of content through the content delivery routers 461 to the communications system 280 for transmission to one or more system users.

A local content source parameter definition and transmission module 729 may be coupled to the system processing module 701 and other modules within the content delivery method 700 and may use download request data and data about available local content and/or local content sources 475 to define configuration and/or operational parameters required for one or more local content sources 475 to deliver local content to one or one content delivery receiver systems 463 and may then transmit these parameters to one or one local content sources 475. A local content reception and decoding module 723 may be coupled to one or more modules within the content delivery method 700 and may receive files and/or data transport streams containing local content from one or more local content sources and may perform any necessary decoding of content and may route these signals to a local content processing module 725. The local content processing module 725 may perform processing functions on the content data that may include adjusting audio levels, combining and/or splitting audio and/or video signals, and adjusting video luminance and chrominance as required for delivery. A local content audio and video playout module 727 may be coupled to one or more other modules of the content delivery method 700 and may serve the function

1 of accessing audio and video content that is stored in aggregator local storage 254 and
2 making this content available as one or more audio and/or video streams for routing to the
3 communications system 280 for delivery to one or more system users.

4 As a result of processing performed by content delivery modules such as the request
5 analysis module 704 and the local content format and metadata analysis module 705, the
6 system processing module 701 may determine that the one or more content files and/or data
7 transport streams may require application of digital rights management schemes, encryption
8 schemes, and/or advertising. Application of these attributes to the content to be delivered
9 may be performed by a digital rights management module 731, an encryption module 733,
10 and an advertising module 735 respectively. The digital rights management module 731 may
11 incorporate mechanisms within the content delivery that may serve to protect the copyrights
12 reserved by the content providers by assigning one or more system users specific and/or
13 limited rights defining how the content may be used. As an example, a user may be allowed
14 to playback a particular program an unlimited number of times, but may be prevented from
15 copying the program onto removable media. The encryption module 733 may apply one or
16 more encryption schemes to content for delivery that may serve to prevent reception of
17 content by parties other than the intended system user recipients. When encryption is used,
18 system users that are authorized to receive encrypted content may possess particular digital
19 information, such as an encryption key, that may be necessary to decrypt content by a user
20 terminal 202. The advertising module 735 may incorporate various types of advertising with
21 content data for delivery to system users and/or may incorporate advertising placeholders that
22 may be used by a user terminal 202 to insert or overlay advertising with delivered content
23 where the advertising may have been downloaded at an earlier time and may be resident on
24 the user terminal 202.

25 Figure 19 is a diagram of processing modules comprising a communications method
26 740 that may reside in one or more of the components of a communications system 280
27 shown in Figure 15, and may control operations of the communications system 280. The
28 communications method 740 includes a master communications system processing module
29 741 that is coupled to one or more other processing modules within the communications
30 method 740 and that may manage the configuration and operation of one or more other
31 processing modules within the communications method 600 to transmit content, user, and

1 administrative data from the aggregator system 201 to one or more user terminals 202 and to
2 transmit user and administrative data from one or more user terminals 202 to the aggregator
3 201. The communications system processing module 741 may also be operably connected to
4 and may communicate and interact with other systems of the aggregator 201 including, but
5 not limited to a system administrator 500, a request and results processing server 300, a
6 content delivery system 460, and one or more components of a wide area distribution system
7 203. In an embodiment, the processing modules within the communications method 740
8 may be interconnected using a bus topology that may allow dynamic interconnectivity
9 between up to all of the processing modules and may support logical addressing of modules
10 for communications routing.

11 The system processing module 741 may be coupled to a user data reception module
12 743 and a user data transmission module 745 that may be parts of the user data transceivers
13 285 shown in Figure 15. The user data reception module 743 interfaces with the wide area
14 distribution system 203 to receive incoming user data transmitted by one or more user
15 terminals 202. The user data reception module 743 may be coupled to a user data analysis
16 and routing module 747 that examines the incoming user data to determine the type of
17 message that is received and to route it accordingly. For example, information updating a
18 system user's profile may be routed to the system administrator 500 and program search and
19 download requests may be routed to the request and results processing server 300. A user
20 data transmission module 745 may be coupled to the system processing module 741 and
21 other modules of the communications method 740 in order to transmit user and
22 administrative data from the aggregator system 201 to one or more user terminals 202. User
23 data to be transmitted may include program availability notification, program search results,
24 advertising, program schedules, billing information, and other administrative data.

25 The system processing module 741 may be coupled to a content transmission router
26 configuration and control module 749 that may control one or more hardware and/or
27 software components of one or more content transmission routers 281 to establish and
28 manage logical and/or physical circuit connections for transmission of content data between
29 the various subsystems shown in Figure 15. The system processing module 741 may also be
30 coupled to a content transmission system parameter definition module 751 that analyzes
31 content delivery requirements and determines system parameters required to configure one or

more content transmission systems 283 to fulfill content delivery. The transmission system parameters may then be used by a content transmission system resource polling module 753 to identify required and available content transmission system 283 resources to fulfill the content delivery. Once transmission system resources have been identified, a content transmission system configuration module 755 uses resource identification data and transmission parameters to configure one or more content transmission systems 283 to deliver content to one or more user terminals 202. After one or more content transmission systems 283 have been configured, the content transmission system management and monitoring module 757 may oversee the transmission systems 283 during the content transfer and may communicate with the master communications system processing module 741 and one or more other modules within the communications method 740 to ensure proper delivery of content through the wide area distribution system 203 to one or more system users.

A transmission encoding module 761 may reside in one or more content transmission systems 283 and may be coupled to the system processing module 741 and other modules within the communications method 740 and may apply one or more encoding schemes to one or more content files, content data streams, and/or user and administrative data files for transmission through one or more components of a wide area distribution system 203. The transmission encoding module 761 may be coupled to a transmission multiplexing module 763 that may operate on two or more content signals to combine the signals into a single composite signal to be transmitted over a single channel carrier. One or more content signals, whether encoded and/or multiplexed, may then be operated on by a transmission modulating module 765 that may modulate one or more content data signals onto one or more intermediate and/or carrier frequencies appropriate for transmission through one or more components of a wide area distribution system 203.

Once one or more content transmission signals have been encoded, multiplexing, and/or modulated, the signals are forwarded to one or more of the following modules coupled within the communications method for transmission of content to one or more user terminals 202 through a wide area distribution system 203: an off-air transmission module 775, a satellite transmission module 777, a wireless transmission module 779, a cable television transmission module 781, and a digital protocol implementation and management module 783. The off-air transmission module 775 may control components that may

transmit content data over one or more television and radio broadcast channels using one or more broadcast antennas 325 as shown in Figure 16. The satellite transmission module 777 may control components that may transmit content data through one or more communications satellites using one or more satellite uplink antennas 326. The wireless transmission module 779 may control components that may transmit content data through one or more wireless distribution channels using one or more wireless distribution antennas 327. The cable television transmission module 781 may control components that may transmit content data through one or more cable headend systems using one more coaxial cable and/or fiber transmission infrastructure 330 components. The digital protocol implementation and management module 783 may reside on one or more digital protocol transmission servers 319 and may encapsulate content for transmission using one or more industry standard and/or proprietary digital protocols through one or more digital protocol transmission gateways 332. The wide area network interface and control module 771 may be coupled to various modules within the communications method 740 and may identify, configure, and/or control components and/or modules providing the interfaces between the content transmission systems 283 and the wide area distribution system 203.

A physical media production module 773 may be coupled to the system processing module 741 and other modules within the communications method 740 and may oversee the automated portion of production of content onto physical media such as DVD, CD-ROM, magnetic tape, and other media suitable for distribution of content by the aggregator system 201. The physical media production module 773 may receive instructions and parameters for production and distribution of physical content media from the system processing module 741 and may be coupled to the content transmission routers 281 to receive content data to be recorded onto physical media.